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(54) CENTRIFUGAL SEPARATOR

(71) I, WILLIAM HOWARD PECK, of 7109 South Pittsburgh, Tulsa, State of Oklahoma, United States of America, a citizen of the United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a centrifugal separator for separating solids from a liquid. More specifically, the invention is concerned with a centrifugal separator of the orbiting basket type wherein a high speed rotatable power-driven carrier has eccentrically mounted thereon a plurality of circumferentially spaced slurry-receiving baskets which orbit about the axis of the carrier and themselves rotate about their own axes. In this type of separator, a rotary feed hopper having radial distribution channels deposits the slurry to be processed in the central region of the baskets and this slurry is flung outwardly of the carrier by centrifugal force and against a series of curved filter screens in associated relation with the baskets. Thus as the screens assume outer ecliptic positions, their concave sides are presented to the oncoming slurry and when they assume inner ecliptic positions, their concave sides are presented counter to the direction of centrifugal force. The screens thus perform alternate filtering and self-cleaning operations. In various intermediate positions where the screens assume generally radial positions with respect to the axis of the carrier, the solid material slides along the screens and is caused to be discharged over the edge of the carrier and thus removed from the separator. The liquid which passes through the screens is trapped by a collector wall and is discharged downwardly by gravity.

While a centrifugal separator of this type may be entirely satisfactory for certain slurries, when it is applied to slurries having solids smaller than 200 mesh, an excess amount of the 200 material passes through the screens and is discharged with the effluent which therefore is not clear liquid.

The present invention is designed to overcome the above-noted limitation that is attendant upon the construction and use of such conventional orbiting basket-type separators and, toward this end, the invention contemplates the provision of a centrifugal separator wherein the orbiting baskets are completely devoid of perforate screens, yet in which the baskets function to remove a major portion of the liquid content of the slurry undergoing processing in an efficient manner.

In carrying out the invention, the rotating baskets are provided with imperforate involute vanes in place of the former perforate screens, the vanes being disposed in nested relationship so that during rotation of the baskets they alternately assume outer and inner ecliptic positions. In its outer ecliptic position, each solid vane thus functions for a brief interval as an individual conventional solid wall centrifuge and receives the slurry thereagainst, blocking its radial progress and effecting rapid settling of the solids on the concave side thereof. This results in a radial gradation of the solids, the clear liquid remaining in a region remote from the vane and the solids becoming compacted against the vane in the form of a cake. Small discharge openings drain the clear liquid from the baskets. As each basket vane gradually turns its other side toward the axis of the carrier, portions of the associated vane move progressively into radial positions so that the prevailing centrifugal force causes the aforementioned unsettled solids and remaining liquid to move along the vane toward a discharge opening near the outer edge of the involute vane where a reentrant hook-like portion on the vane establishes a trap for conducting this semi-clear liquid to said discharge opening. Such change of direction of the vane also gradually decreases the compacting force of the "cake" against the concave side of the vane until this force becomes non-existent and centrifugal force begins to act on the cake in the opposite

direction, thus stripping the cake from the concave side of the vane and allowing it to tumble into the normal radial gravitional field and thus be ejected from the edge of the basket platform.

An important feature of the invention resides in the provision of a novel means for periodically flushing any solid accumulations from the discharge openings for the semi-solids. A still further feature of the invention consists of a novel means for supplying a lubricant to certain of the bearings for the rotating baskets.

In the accompanying drawings:

FIG. 1 is a vertical section taken centrally through a centrifugal separator embodying the invention;

FIG. 2 is a fragmentary horizontal section on line 2—2 of FIG. 1;

FIG. 2a is a fragmentary side view illustrating certain supporting rollers;

FIG. 3 is an enlarged horizontal section on line 3—3 of FIG. 1;

FIG. 4 is a side view of the structure of FIG. 3;

FIG. 5 is a fragmentary enlarged perspective view resulting from a radial section on line 5—5 of FIG. 3;

FIG. 6 is a fragmentary enlarged perspective view resulting from a radial section on line 6—6 of FIG. 3;

FIG. 7 is an enlarged fragmentary detail view illustrating certain water and oil distribution facilities; and

FIG. 8 is a schematic plan view illustrating a belt drive mechanism and also illustrating the orbital and rotational characteristics of the centrifuge baskets.

Referring now to FIG. 8, and considering this view in conjunction with FIGS. 1 and 2, a centrifugal separator 10 includes a carrier 12 in the form of a circular deck plate, the carrier being continuously rotatable about a vertically extending main drive shaft 14. Rotatably and eccentrically mounted on the carrier is an annular series of four slurry-receiving separator baskets 16 which are mounted on vertical drive hubs 18 and are equally spaced so that they assume positions 90° apart.

The baskets 16 are thus capable of orbital revolution about the axis of the carrier 12 and of individual rotation about the axes of their respective hubs 18, rotation of the carrier taking place in a counterclockwise direction at a speed on the order of 1200 rpm and rotation of the baskets 16 taking place at a reduced speed on the order of 6 rpm

A rotatable slurry distributing feed hopper 22 (FIG. 1) deposits slurry continuously onto the centers of the baskets 16. and separation of the slurry constituents takes place in the orbiting and rotating baskets in three stages, thus dividing and discharging such constituents in the form of (1) substantially clear liquid; (2) semi-clear liquid; and (3) solids, these components being conducted separately from the separator.

To effect such separation, each basket 16 is equipped with a series of imperforate, spiral, slurry-restraining vanes 24 which function as dams and are arranged in nested, circumferentially and radially overlapping relationship. These vanes project vertically from a platform 26, have their inner vertical leading edges close to the center of the platform 26, and have their outer vertical trailing edges in close proximity to the periphery of the platform.

From the above description, it will be apparent that there will be a tendency for the slurry which is deposited in each basket to be flung radially outwardly from the axis of the carrier as indicated by the broken line arrows C in FIG. 8. Since the baskets 16 themselves rotate at a relatively low speed, these baskets exert no appreciable centrifugal effect on the slurry which continues to move radially outwardly on the carrier. However, the various spiral vanes 24, due to rotation of the baskets, move into and out of the radial paths of movement of the slurry which is travelling across the surfaces of the baskets and, in so moving, they cause disharge of the slurry from the baskets in three ranges of solids-density. The first range of solids-density includes substantially clear liquid which flows downwardly through the basket platforms 26 through series of small holes 30 near the convex sides of the vanes 24. The remaining liquid content of the slurry is restrained by the concave sides of the vanes 24, and since the liquid is incompressible, the particles which are in suspension are subject to centrifugal radial displacement so that they move against the vanes and become compacted in the form of solid cakes which adhere to the vanes. Some of these particles which do not have time to settle remain in suspension and establishes a region of semi-clear liquid which slides along the vanes and becomes trapped in hook-like end portions 32 on the vanes and passes from the basket through discharge holes 34 thus leaving the substantially dry solids adhering to the vanes. As the baskets continue to rotate, the positions of the vanes 24 with respect to the radial gravitational field progressively become reversed so that the compacting force of the solids against the vanes gradually diminishes while the centrifugal force acting on these solids gradually undergoes a direction change until a point is reached where the former compacting force exerted on the solids now becomes a loosening force tending to dislodge the dryer solids from the vanes so that they are flung radially outwardly over the edges of

the platforms 26. The holes 30 thus establish a first region of liquid discharge; the small holes 34 establish a second region of semi-clear liquid discharge; and the periphery of the basket platform establishes a third region of solids discharge.

Considering the centrifugal separator in greater detail, a base frame 40 (FIG. 1) is provided with an annular series of vertical legs 42 which support a bearing cage 44 including a circular horizontal lower supporting plate 46, a circular horizontal upper supporting plate 48, and vertical connecting members 50. Vertically extending webs 52 serve to support at their upper ends a fixed horizontal platform 54 which supports a plurality of circumferentially spaced inverted channels 56 having vertical side legs 57 and horizontal connecting portions 58 each of which has bolted thereto a radially extending centering wing 59. The wings serve to support a dome-like hood 60 which overlies the deck plate 12 and the baskets 16. The hood 60 carries a feed hopper 62 which constitutes an element of the aforementioned slurry distribution assembly 22.

The feed hopper 62 is mounted within an opening 64 in the hood 60 and is provided with a hollow stem 66 which communicates with the upper end of a rotatable distribution manifold 68 having radially diverging branch conduits 70 which establish distribution channels 72 and discharge slurry into the center of the baskets 16. The distribution manifold 68 is driven in unison with the baskets 16 as they revolve about the axis of the carrier 12 so that proper feeling of the baskets 16 is at all times maintained.

The main drive shaft 14 for the rotary carrier 12 is hollow and is rotatably supported in lower and upper bearing assemblies 74 and 76 which assimilate the vertical thrust of the rotatable components. The drive shaft 14 is continuously driven by an electric motor *M* through a belt and pulley arrangement 79. The upper end region of the drive shaft 14 has keyed thereto a vertical tubular drive sleeve 81, the lower end of which has an annular flange 83 which supports the carrier 12. A drive sleeve 80 surrounds the sleeve 81 and is bolted to the flange 83. The carrier supports a series of four bearing assemblies 82, each of which supports one of the basket drive hubs 18. Each drive hub 18 at its upper end supports the associated basket platform 26.

As previously described, the vanes 24 are supported at their lower edges on the platform 26. A circular top wall 84 on the upper edges of the vanes 24 establishes a series of spiral passages between each pair of adjacent vanes. Each top wall 84 has a central opening 86 and the lower end of the associated branch conduit 70 projects through such opening so as to discharge slurry into the central region of the basket. Each top wall 84 carries an upper cup-shaped hub 88 which is rotatable in an upper bearing assembly 90 which is supported on an upper carrier plate 92 at the upper end of the drive sleeve 80. The plate 92 supports a series of arms 93 which are secured to the branch conduits 70.

In order to lubricate the upper bearing assemblies 90, oil mist is supplied through a conduit 94 to a swivel joint 96 from whence it passes upwardly through the drive shaft 14 and sleeve 80. From the latter, the oil mist is distributed through branch passages 98 to the four upper bearing assemblies 90. The lower bearing assemblies 82 may similarly be supplied with an oil mist through branch passages 99. The distribution of oil mist from the sleeve 80 to the bearing assemblies 82 and 90 are shown in FIG. 7 wherein it will be observed that the upper end of the sleeve 80 is closed by a plate 100 having openings 102 which communicate through fittings 103 and elbows 104 with the branch passages 98 and 99. Suitable T-fittings 105 (FIG. 1) are interposed in the passages 98 and are connected to the passages 99.

Means are provided for flushing the aforementioned discharge holes 34 in the basket platforms 26. Accordingly, a stationary vertical water supply pipe 110 (FIGS. 1 and 7) projects downwardly through the hopper 62 and the rotatable manifold 68, is supported in the feed hopper 62 by a spider 111, and is connected through a swivel joint 112 with a series of four generally water distribution branch pipes 114 which lead to the four baskets 16. The outer end of each water distribution branch pipe 114 communicates with a non-rotating outer bearing housing ring 116 (FIG. 5) having an internal passage 118 leading to a slot-like pressure pocket 120 which periodically supplies momentary impulses of water to a series of three terminal carrier pipes 122 (figs. 3, 4 and 5) by means of which such impulses are conducted to the hook portions 32 of the vanes 24 for flushing the holes 34 and conducting accumulated solids to a region of discharge.

As shown in FIG. 6, the radial branch passages 98 communicate through oil mist condensing fittings 124 with internal passages 126, such passages discharging the oil mist onto the upper sides of the upper bearing assemblies 90, each of which consists of an inner race 128, an outer race 130, and an annular series of bearing rollers 132 between the inner and outer races 128 and 130. An oil reservoir 134 on each outer bearing retaining ring 116 underlies the upper bearing assembly 90. Normally, when the separator is not in use, the oil reservoir is

full, when carrier rotation commences the oil establishes an annular "pond" into which the bearing rollers 132 dip. This dip-lubrication augments the oil mist lubrication afforded by the oil passages 98.

The inlet ends of the water carrier pipes 122 are connected to elbow fittings 135 (FIGS. 3, 4 and 5) which communicate with radial ports 136 in a porting ring 137 which rotates with the top wall 84 by means of drive studs 138 (FIG. 6) carried in brackets 139 on the top wall 84. The outlet ends of the pipes 122 communicate through elbow fittings 141 with small holes 143 in the top wall 84. These holes 143 register with the hook portions 32 of the vanes 24. Thus, each time one of the radial ports 136 in the porting ring 137 moves into register with the water pocket 120 in the non-rotatable retaining ring 116, a quantity of water will be injected into the associated carrier pipe 122 and this water will be expelled from the outlet end of the pipe through the adjacent hole 143 so as to flush out the underlying hook portion 32 and its associated semi-solids discharge outlet 34. The various carrier pipes 122 of each basket span approximately a 90° arc on the periphery of the basket so that each time one of the ports 136 moves into register with the water supply pocket 120 at the nine o'clock position of FIG. 3, the flushing action will take place at the six o'clock position. Thus, the ports 136 and the pocket 120 consitute sliding cut-off valve devices by means of which the discharge holes 34 are periodically flushed.

Considering further the nature of an individual basket 16, and referring specifically to FIGS. 3 and 4, the vanes 24 encompass approximately a 270° sector of the basket platform 26. At spaced regions along each vane 24, vertical open-ended tubes 140 are welded to the convex side of the vane and receive clamping bolts 142 by means of which the top wall 84 and the platform 26 are caused to clamp the vane 24 therebetween. Suitable wear-resistant anti-friction liners 146 are applied to the top wall 84 and the platform 26 of each basket. As shown in FIG. 3, small deflector wings 148 extend between the tubes 140 and their associated vanes 24 and establish small ramp portions which deflect the slurry so that these tubes will offer no resistance to the free passage of the slurry along the vanes.

The lower bearing assembly 82, in addition to the hub 18, includes a bearing unit proper 150 (FIG. 1) having an inner race and an outer race which is supported in a bearing cage 152. Such cage is supported on the rotatable carrier 12. The hub 18 is driven through a power train which derives its motion from the central vertical drive shaft 14 for the carrier 12 and which, as previously described, derives its motion from the motor *M*.

Considering now the power train for the baskets 16, such power train embodies a gear 154 (FIG. 1) on the vertical drive shaft 14 which meshes with a similar gear 156 on the lower end of a vertical jack shaft 158. The latter is journalled in bearing brackets 160 on one of the connecting members 50. A third gear 162 on the upper end of the jack shaft meshes with a lower gear 164 which is mounted on the drive sleeve 77. A sun gear 166 on the sleeve 77 meshes with idler planet gears 168 which are rotatable on the lower ends of vertical spindles 170 which are supported on the carrier 12. The planet gears 168 mesh with terminal power train gears 172 which are secured to downward extensions on basket hubs 18. The upper portion of the above described power train is enclosed in a gear housing 176 which is supported by bolts 177 that are threadedly received in the carrier 12.

The manner in which separation of the three-phase variable density solids discharge materials is effected is disclosed in FIGS. 1 and 4. Three discharge areas, each of which is in the form of an annulus, are designated at *L*, *SS* and *S*. *L* represents the clear liquid discharge annulus; *SS* represents the semi-clear liquid discharge; and *S* represents the solids discharge.

To separate the variable density solids, a first fixed cylindrical wall 180 surrounds the gear housing 176 and is supported on the webs 52. A second fixed wall 184 surrounds the wall 180 and defines the discharge annulus for clear liquid. This second wall 184 is provided with an inwardly projecting horizontal ledge portion 186 (FIG. 4) and is supported on the webs 52. A third fixed wall 188 is spaced outwardly from the wall 184 and is also supported from the webs 52. The third wall is cylindrical and has at its upper end a horizontal shelf 190, the inner periphery of which directly opposes the rims of the basket platforms 26 and is at the same horizontal level. Said wall 188, in combination with the wall 184, defines the semi-clear liquid discharge annulus *SS*.

A fourth cylindrical solids-deflection wall 192 is independently rotatable It is belt driven under the control of an auxiliary motor *M2* (FIGS. 1 and 8), and in combination with the fixed wall 188, defines the solids discharge annulus *S*.

Considering now the three different categories of separated materials, the clear liquid which issues from the holes 30 passes downwardly through relatively long depending discharge tubes 194 (FIGS. 1 and 4), which extend below the level of the horizontal ledge 186 so that the liquid is conducted beneath this ledge portion and flows downwardly through the discharge

annulus L for conduction from the separator. The semi-clear liquid which passes downwardly through the holes 34 passes through short depending tubes 196 which terminate in a plane slightly above the level of the horizontal ledge portion 186 so that this material flows downwardly through the discharge annulus SS for separate conduction from the separator. The nearly dry solids which are flung from the periphery of the baskets pass over and across the horizontal shelf portion 190 of the wall 188 and are flung against the rotating wall 192 from whence they fall downwardly by gravity through the annulus S and also are separately conducted from the separator.

In order to remove such solids as accumulate on the wall 192, fixed scraper elements 200 are secured by bolts 202 (FIG. 2) to the cylindrical wall 188 and bear against the rotating wall 192, the loosened solids falling through the discharge annulus S. The cylindrical wall 192 is adapted to be driven at a relatively low rate of speed by the auxiliary motor $M2$, the latter operating through a gear reduction device 204 having an output shaft 206. Said shaft carries a drive pulley 208 over which a dual drive belt 210 passes. The belt also passes around a drum 212 which is secured to and encircles the cylindrical wall 192. A spring-biased tension take-up roller 216 maintains tension in the belt.

The rotating wall 192 and its associated drum 212 are rotatably supported by horizontal rollers 220 (FIGS. 1 and 2) and vertical rollers 222. The rollers 220 are carried in U-shaped supports 224 on the platform 54. The rollers 222 are carried in supports 228 which depend from the platform 54. Cover plates 230 close the outer sides of the channel supports 45. A cylindrical wall 231 which is supported on the platform 54 constitutes a guard for the drive belt 210.

In the operation of the herein described centrifugal separator, the slurry or other material to be separated is supplied to the feed hopper 62 and flows downwardly through the distribution channels 72 for continuous discharge into the baskets 16 in the central regions thereof. As soon as the slurry is deposited on the platforms 26, a high centrifugal force is imparted thereto tending the fling the same radially across the slowly rotating platforms. Due to the overlapping arrangement between the vanes 24, some portion at least of one of the vanes will be disposed in the path of movement of the slurry on each base and, thus, slurry will be forcibly projected against the concave side of such one vane.

Each vane functions somewhat in the manner of a tilting receptacle containing a mixture of solids and liquids. The centrifugal force acting on the mixture is many times the force of gravity and it throws the solids radially against the "bottom" of the receptacle which, in this instance, is the concave side of the vane. The majority of the solids becomes compacted on the "bottom" of the receptacle (vane) in the form of a cake. Other solids which does not have the necessary time to settle, remains in suspension and collects near the "bottom" of the receptacle in the vicinity of the cake, while substantially clear liquid remains near the "top" of the receptacle, i.e., in the vicinity of the small holes 30. The net result is that a diminishing solids-gradation takes place and the clear liquid is drained off through the holes 30 and their associated relatively long discharge tubes 194 and thus flows out through the discharge annulus L as previously described. At the same time, additional liquid and some solids which have not been compacted are trapped by the hook portions 32 on the vanes 24 and flows out in the form of a semi-clear liquid through the holes 34, the short discharge tubes 196, and the annulus SS. Removal of liquid by way of the holes 30, and of additional liquid with some solids by way of the holes 34, proceeds at a rate somewhat faster than the rate of feed of slurry into the baskets so that by the time the trailing or outer edge of any given vane has closely approached the periphery of the carrier 12, the "receptacle" (vane) has been drained of its liquid content and only the compacted cake of solids remains on the concave side of the vane. The subsequent direction change of the vanes as it moved inwardly with respect to the carrier results in a reversal of the centrifugal force which is applied to the caked solids with the result that the latter become loosened and restored to the free gravitational field where they are flung radially outwardly and against the rotating wall 192 from whence they are discharged downwardly through the annulus S.

Clogging of the various holes 34 is avoided by the previously described flushing action which is intermittently exerted upon such holes once during each 360° movement thereof around the rotational axes of the baskets. This flushing action is initiated each time one of the three ports 136 in the rotating porting ring (FIGS. 3, 4 and 5) moves into radial register with the water under pressure in the fixed pocket 120 so that a momentary supply of water is conducted through the adjacent carrier pipe 122 and introduced through the small hole 143 in the top wall 84 of each basket at a region of 90° removed from the pocket, such hole being in vertical register with one of the hook portions 32 of one of the vanes 24 at

the precise moment that the port 136 moves into register with the fixed pocket 120. Such water impulse not only flushes the adjacent discharge hole 34 but it also flushes the hook portion 32 of the vane 24.

WHAT I CLAIM IS:—

1. A centrifugal separator adapted to dehydrate solids in a slurry, including a horizontal carrier which is rotatable about a central vertical axis, a plurality of separator baskets eccentrically and rotatably mounted on said carrier in circumferentially spaced relationship for rotation about respective vertical axes and for orbital movement about the axis of the carrier, each basket including a horizontal basket platform adapted to receive slurry thereon, distribution channels rotatable with the carrier and leading to the central regions of the baskets for depositing slurry therein, said separator being characterized by the provision of a plurality of imperforate slurry-restraining walls projecting upwardly from each basket platform and presenting concave surfaces which face generally inwardly of the platform so that each time an individual wall assumes an outside ecliptic position with respect to the axis of the carrier and the axis of the basket, slurry will be flung radially outwardly of the carrier by centrifugal force and the solids therein caused to settle toward and against the concave surface of such wall while a diminishing solids gradation will take place radially inwardly of both the basket and the carrier, and when such wall progresses toward an inside ecliptic position, the settled solids on the concave wall surface will be dislodged by centrifugal force and flung from the basket, there being a first opening in said platform between said concave surface and the axis of the basket at a region of sparse solids density radially remote from said concave surface for discharge of substantially solids-free clear liquid from the basket, and a second discharge opening between said concave surface and the axis of the basket at a region of high solids density close to said concave surface for discharge of semi-clear liquid from the basket, means underlying the carrier, common to all of the baskets, and establishing a first discharge annulus for the liquid issuing from said first opening in the basket platforms, means underlying the carrier, common to all of the baskets, and establishing a second discharge annulus for the semi-clear liquid issuing from said second openings in the basket platforms, means establishing a third discharge annulus for solids which are flung from the baskets, means for rotating the carrier at a relatively high rate of speed, means for rotating the individual baskets at such slow rate of speed that no appreciable centrifugal force is imparted to the slurry deposited therein other than that which is imparted thereto by rotation of the carrier.

2. A centrifugal separator according to claim 1, wherein the concave surfaces of said walls are generally of involute configuration, have their leading edges disposed in the vicinity of the axis of rotation of the basket and their trailing edges positioned adjacent the periphery of the basket, and are disposed in circumferentially spaced, intertwined, nested circumferentially and radially overlapping relationship.

3. A centrifugal separator according to claim 2, wherein each concave wall surface encompasses a major sector of the associated basket platform.

4. A centrifugal separator according to claim 3, wherein each concave wall is established by the provision of an upstanding involute vane which encompasses approximately a 270° sector of the associated basket platform.

5. A centrifugal separator according to claim 4, including means in the vicinity of said second opening for entrapping said semi-clear liquid and directing it toward said latter opening.

6. A centrifugal separator according to claim 5, wherein said second opening is disposed in close proximity to the trailing edge of the vane and said entrapping and directing means for the semi-clear liquid comprises a hook-like reentrant portion which is formed on the trailing edge of the vane and partially encompasses said second opening.

7. A centrifugal separator according to claim 6, including a top wall for each basket overlying the vanes thereof, said top wall, in combination with the basket platform and each pair of adjacent vanes, establishing an involute guide path for slurry during rotation of the basket and through which the slurry passes during settling of the solids therein under the centrifugal force imparted thereto due to the high speed rotation of the carrier.

8. A centrifugal separator according to claim 7, including opposed anti-friction liners disposed on and coextensive with said basket platform and top wall.

9. A centrifugal separator according to claim 7, including a series of vane-reinforcing tubes extending vertically between said basket platform and top wall, and clamping bolts projecting through said tubes and serving to clamp said top wall against the upper edges of the vanes.

10. A centrifugal separator according to claim 9, including a series of deflector wings extending between the vanes and vane-reinforcing tubes and establishing ramp portions which deflect the slurry past said tubes.

11. A centrifugal separator according to claim 6, including means incident to and effective during rotation of each basket for periodically injecting a supply of fresh water against each reentrant hook portion to flush residual solids through said second opening in the basket platform.

12. A centrifugal separator according to claim 6, including a non-rotating retaining ring for each basket, encompassing a portion of the latter, fixed to and movable bodily with the carrier, and provided with a water distributing pressure pocket therein, a porting ring concentric with the basket and rotatable bodily therewith, a plurality of water-distributing channels mounted on and movable bodily with the basket and having outlet ends disposed in flushing register with the hook portions of the vanes, said channels having their inlet ends secured to said porting ring, and sliding cut-off valve means on the porting ring and retaining ring and effective during rotation of the baskets to intermittently admit predetermined quantities of water from the pressure pocket to the channels for conduction to said hook portions, and means for continuously supplying water under pressure to said pressure pocket.

13. A centrifugal separator according to claim 12, wherein said sliding cut-off valve means comprises a series of radial bores in the porting ring and in communication with the inlet ends of said distributing channels and movable into and out of register with said pressure pockets during rotation of the basket.

14. A centrifugal separator according to claim 1, including a roller bearing assembly interposed between said non-rotating retaining ring and the basket, said retaining ring being provided with internal oil passages leading to said roller bearing, and means for continuously supplying oil to said internal oil passages.

15. A centrifugal separator according to claim 1, wherein said means for rotating said carrier at high speed comprises a central vertical drive shaft upon which the carrier is mounted in coaxial relationship, and the means for rotating the basket at slow speed comprises a first gear mounted on said drive shaft, a rotatable basket drive sleeve disposed on said drive shaft, a jack shaft mounted for rotation about a fixed vertical axis, a second gear on said drive sleeve, third and fourth gears mounted on the jack shaft and meshing with said first and second gears respectively, and a system of planetary gearing connecting said second gear to the basket in driving relationship, said planetary gearing comprising a sun gear mounted on said drive sleeve, a terminal gear mounted on the basket, and a planet idler gear meshing with said sun gear and terminal gear and mounted on the carrier.

16. A centrifugal separator according to claim 1, including a cylindrical solids deflection wall concentric with the carrier and disposed at the general horizontal level of the basket platforms for directing solids flung from the baskets into said third discharge annulus.

17. A centrifugal separator according to claim 16, wherein said solids-deflection wall is rotatable about the axis of the carrier, and the separator further includes a series of fixed scraper blades which makes sliding contact with said solids-deflection wall for dislodging solids which adhere to the layer and causing them to be discharged into said third discharge annulus, and means for rotating said solids-deflection wall.

18. A centrifugal separator according to claim 17, wherein the means for rotating said solids-deflection wall is separate from the means for rotating the carrier and comprises an electric motor having a drive pulley thereon, and an endless flexible drive member encompassing said solids-deflection wall and drive pulley.

19. A centrifugal separator according to claim 1, wherein said means establishing said second discharge members includes a fixed annular wall which is provided with an inturned horizontal ledge portion which extends between said basket platform and the deck plate, said first discharge opening communicates with a relatively long discharge tube which extends below the level of said ledge portion for discharging the sparse density material into said first annulus beneath said ledge portion, and said second discharge opening communicates with a relatively short discharge tube which lies wholly above the level of said ledge portion for discharging the higher density material into said second annulus above said ledge.

20. A centrifugal separator according to claim 19, including a series of wall-confining rollers rotatably carried by the framework and tractionally engaging an outer side of said rotatable wall for centering the same with respect to said drive shaft, and a second series of rollers rotatably carried by the framework and tractionally engaging said rotatable wall in wall-supporting relationship.

21. A centrifugal separator adapted to dehydrate solids in a slurry, substantially as described with reference to the accompanying drawings.

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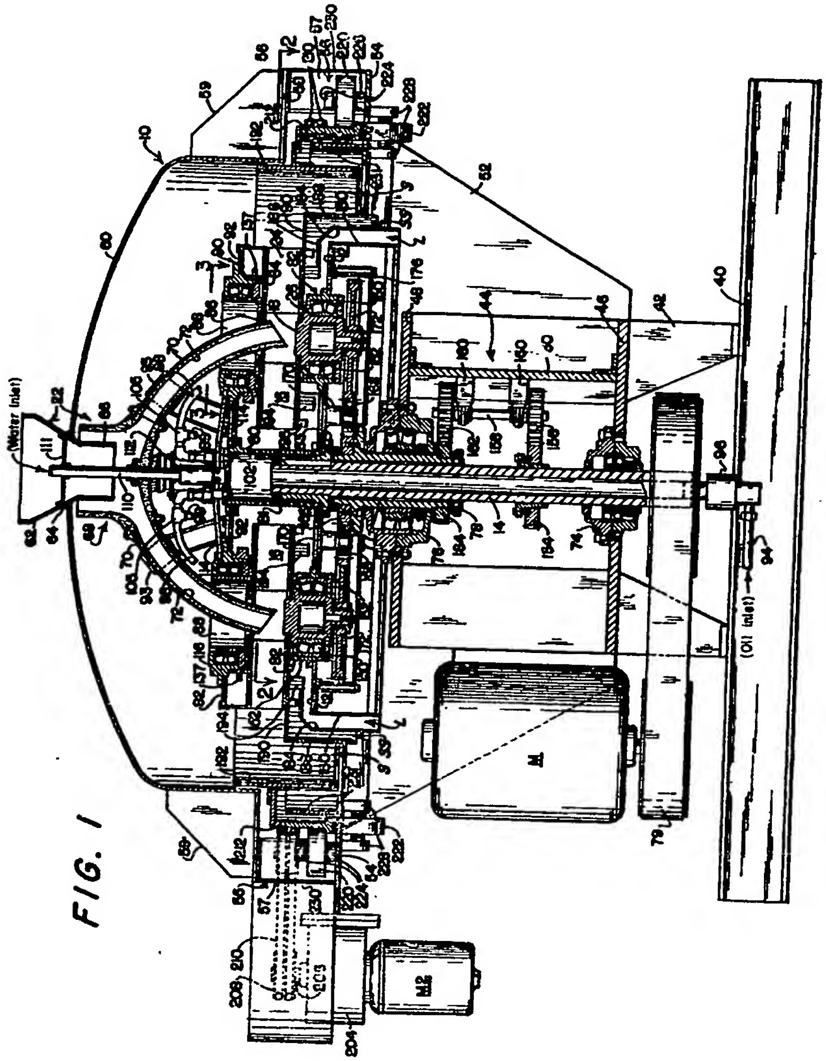


FIG. 1

FIG. 2

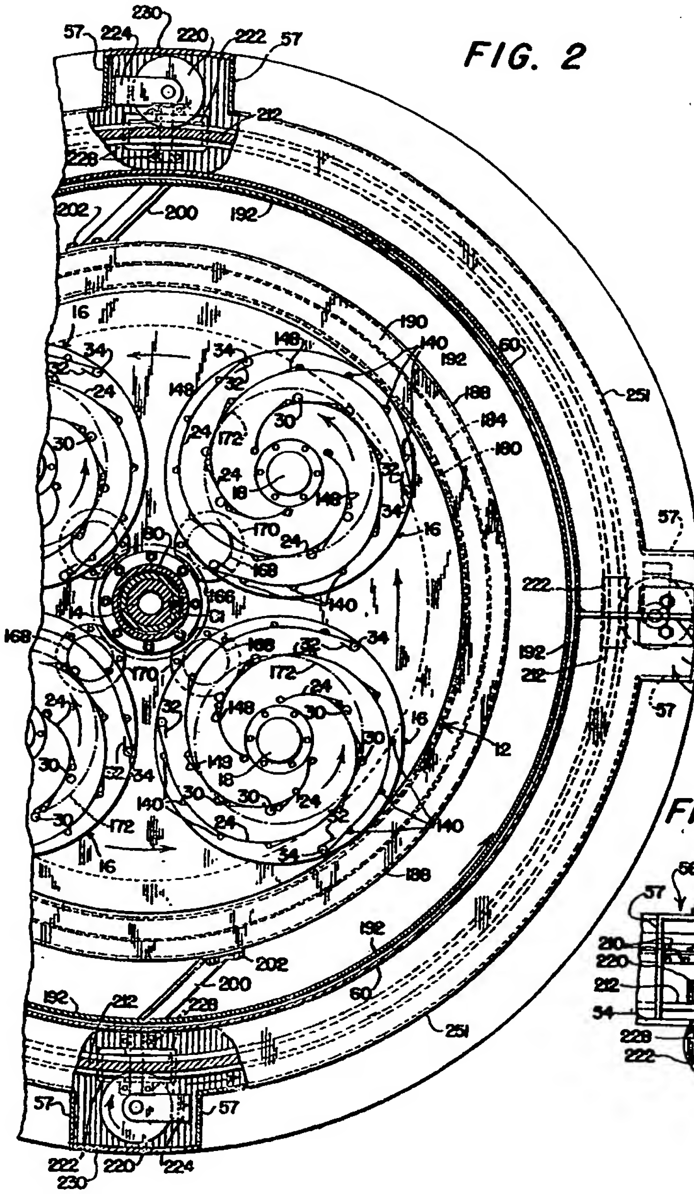


FIG. 2a

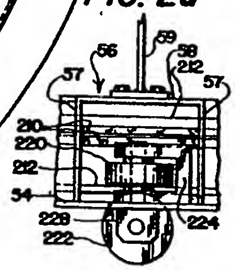
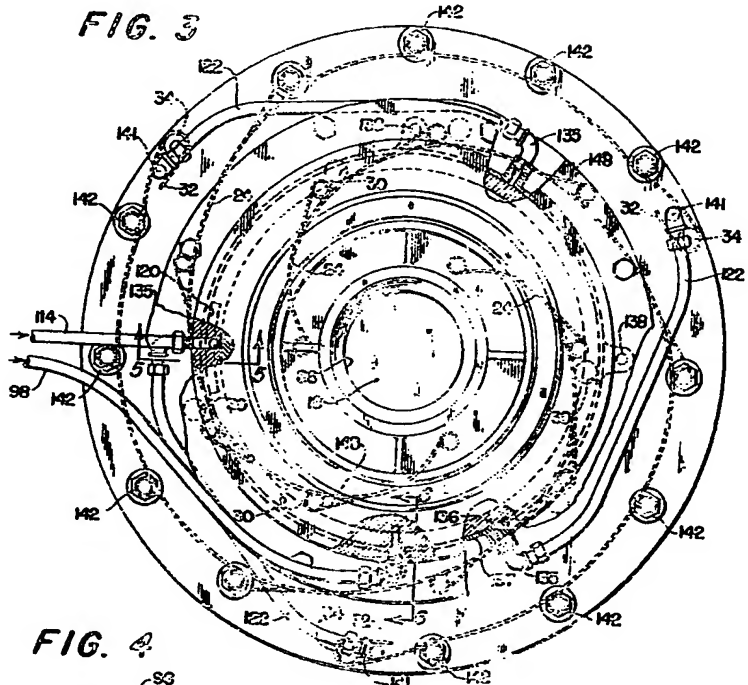


FIG. 3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141
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30
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5
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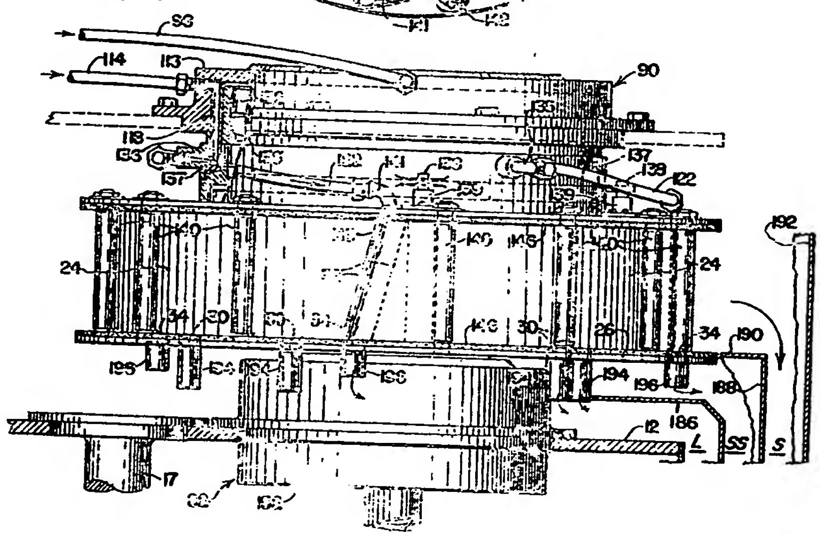
142
22

FIG. 4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113
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S

FIG. 5

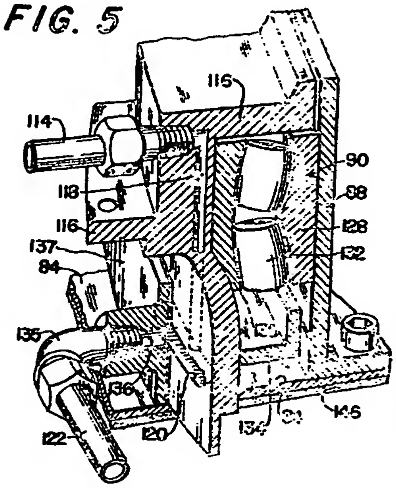

FIG. 6

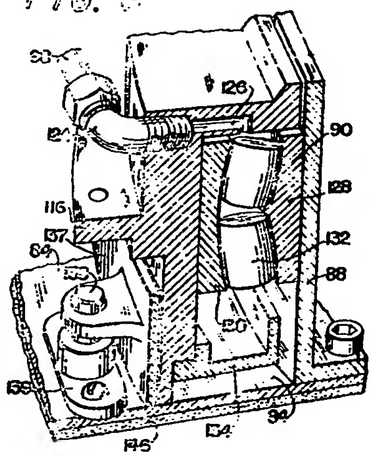

FIG. 8

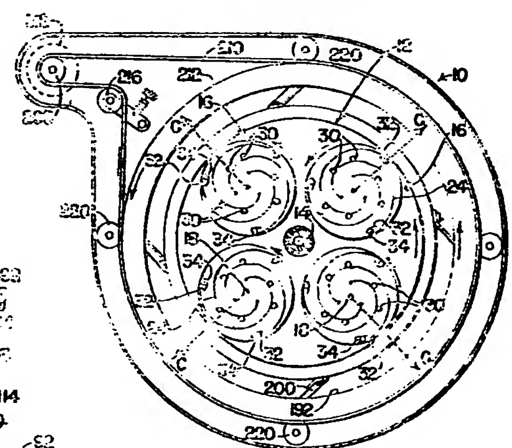

FIG. 7